

Chapter 8

WATER SOURCE OPTIONS

Water source options has been defined in the Planning Document as options that make additional water available from existing or new sources, such as wastewater reuse or the Floridan aquifer, or options that reduce water use, such as conservation. This chapter discusses options that increase water availability. Water conservation is discussed in Chapter 7.

WELLFIELD EXPANSION

Expansion of an existing public water supply wellfield is usually selected by a utility when additional raw water is required. The costs related to wellfield expansion for the major aquifer systems in the planning area are provided in Table 24. The costs are based on a 16-inch diameter well and a maximum Surficial well depth of 200 feet and maximum Floridan well depth of 900 feet.

Table 24. Well Costs for Aquifer Systems.

Aquifer System	Drilling Cost (per well)	Equipment Cost (per well)	Engineering Cost (per well)	O&M Cost (per 1000 gal)	Energy Cost (per 1000 gal)
Surficial	\$36,000	\$49,000	\$13,000	\$.003	\$.020
Floridan	\$92,000	\$52,000	\$14,000	\$.003	\$.032

Source: PBS&J, 1991, Water Supply Cost Estimates.

Ground water wells are limited in the amount of water they can yield by the rate of water movement in the aquifers, the rate of recharge, the storage capacity of the aquifer, environmental impacts, and proximity to sources of contamination and saltwater intrusion. These factors together determine the number, size, and distribution of wells that can be developed at a specific site. Long-range planning by the water suppliers to identify future wellfield sites, and to protect those future sites from contamination by controlling land use activities within the influence of the wellfield, is important in ensuring satisfactory future water supply.

UTILITY INTERCONNECTIONS

Interconnection of treated and/or raw water distribution systems between two or more utilities can provide a measure of backup water service in the event of disruption of a water source or treatment facility. Additionally, when considering future potable water needs, bulk purchase of treated water from neighboring utilities should be evaluated in lieu of expanding an existing withdrawal and/or treatment plant. A detailed study of distribution systems proposed for interconnection should address system pressures, physical layout of the supply mains, impacts on fire flows and compatibility of the waters.

WASTEWATER REUSE

Reuse is the deliberate application of reclaimed water for a beneficial purpose, in compliance with the FDEP and water management district rules. Reclaimed water is wastewater that has received at least secondary treatment and is reused after flowing out of a wastewater treatment plant (Chapter 62-610, F.A.C.). Potential uses of reclaimed water include landscape and agricultural irrigation, ground water recharge, industrial uses, environmental enhancement and fire protection. Additional discussion of reuse, including reclaimed water regulations and more detailed information on potential uses, is provided in Appendix I.

Encouragement and promotion of wastewater reuse and water conservation are formal state objectives. The State Water Policy requires the FDEP and water management districts to advocate and direct the reuse of reclaimed water as an integral part of water management programs, rules, and plans. Several regulations also require an evaluation of reuse versus other disposal methods prior to issuance of Department permits.

Reuse Costs

The costs associated with implementation of a reuse program vary depending on the size of the reclamation facility, the facility equipment needed, the extent of the reclaimed water transmission system, and the regulatory requirements. Some of the major costs to implement a public access reuse system are:

- Advanced secondary treatment
- Reclaimed water transmission system
- Storage facilities
- Alternate disposal
- Application area modifications

Cost savings include negating the need for or reducing the use of alternative disposal systems, negating the need for an alternate water supply by the end user, and reduction in fertilization costs for the end user. These costs and savings are further discussed in Appendix I.

Existing Treatment Facilities

There are 12 existing regional wastewater treatment facilities in the UEC Planning Area. These facilities treated 13.05 MGD of wastewater in 1993. Of this, 3.07 MGD was reused by eight facilities. In addition to reuse, 3.59 MGD was disposed of by deep well injection and 6.39 MGD was disposed of by surface water discharge. (As of February 1998, there were no regional utilities that used surface water discharge for disposal in the planning area.) The water that was disposed of by deep well injection or discharged to surface water could be made available for reuse with the addition of regulatory mandated equipment including filtration and the associated chemical feed system, disinfection facilities and reclaimed water monitoring equipment. The volume of wastewater treated by regional wastewater treatment facilities is projected to increase to about 43 MGD by 2010. Summarized wastewater facility information is provided in Appendix E.

SURFACE WATER STORAGE

This option involves the capture and storage of excess surface water during rainy periods and subsequent release during drier periods for environmental and human uses. Regionally, surface water storage could be used to attenuate freshwater flows to the St. Lucie Estuary (SLE) and the Indian River Lagoon (IRL) during rainy periods and meet minimum flows during drier periods. In addition, these facilities could increase surface water availability for current and projected agricultural uses, and decrease the demand on the Floridan aquifer. This option also includes the interdistrict transfer of surface water, potentially with the SJRWMD.

Locally, strategically located surface water storage (primarily storage in combination with improved storm water management systems) could recharge SAS wellfields, reduce the potential for saltwater intrusion and reduce drawdowns under wetlands. Onsite storage in agricultural areas may reduce the need for water from the regional canal system and withdrawals from the Floridan aquifer.

Costs associated with surface water storage vary depending on site specific conditions of each reservoir. A site located near an existing waterway will increase the flexibility of design and management and reduce costs associated with water transmission infrastructure. Another factor related to cost would be the existing elevation of the site. Lower site elevations would allow for maximum storage for the

facility while reducing costs associated with water transmission and construction excavation. Depth of the reservoir will have a large impact on the costs associated with construction. Deeper reservoirs result in higher levee elevations which can significantly increase construction costs.

Costs associated with two types of reservoirs are depicted in Table 25. The first is a minor facility with pumping inflow structures and levees designed to handle a maximum water dept of 4 feet. It also has internal levees and infrastructure to control internal flows and discharges. The second type shown below is a major facility with similar infrastructure as the minor facility. However, the water design depths for this facility range from 10 to 12 feet. Costs increase significantly for construction of higher levees but can be offset somewhat by the reduced land requirements.

Table 25. Surface Water Storage Costs.

Reservoir Type	Construction Cost \$/Acre	Engineering/ Design Cost \$/Acre	Construction Admin. \$/Acre	Land \$/Acre	Operations & Maint. \$/Acre
Minor Reservoir	2,842	402	318	4,500	118
Major Reservoir	7,980	904	451	4,500	105

Costs for the minor reservoir are based on actual construction bid estimates received and awarded for similar projects currently being built in the Everglades Agricultural Area (EAA). Costs of these four Stormwater Treatment Areas (STAs) were averaged to develop the \$/Acre costs. Land costs have been changed to generally reflect land values in the Upper East Coast Planning Area. Costs for the major reservoir were developed based on the average cost estimates from the proposed Ten Mile Creek project and from the Regional Attenuation Facility Task Force Final Report, April 1997 estimates for major Water Preserve Areas.

AQUIFER STORAGE AND RECOVERY

Aquifer storage and recovery (ASR) is defined as the underground “storage” of injected water in an acceptable aquifer during times when water is available, and the subsequent “recovery” of this water when it is needed. Simply stated, the aquifer acts as an underground reservoir for the injected water, reducing the water loss to evaporation. Sources of injection water could include treated and untreated ground- and surface-water, and reclaimed water.

Because of limited water resources, increasing demands, and more stringent water quality standards, ASR technology is receiving growing attention. The regulatory criteria for ASR permitting is discussed in Appendix I.

ASR Costs

Estimated project costs for ASR consisting of a 900-foot, 16-inch well, with two monitoring wells using treated water in Florida are shown in Table 26. One system uses pressurized water from a utility; whereas the second ASR system uses unpressurized treated water, thus requiring pumping equipment as part of the system cost. Using the assumptions that the capital costs are amortized at 8 percent over 20 years, that the water recovery efficiency is 75 percent, and 100 days of recovery at the daily recovery capacity, the costs in Table 26 translate into costs of \$.23 to \$.27 per thousand gallons. However, utilities implementing ASR systems may incur additional costs for surface facilities, such as piping, storage, and rechlorination. Other available data indicate that “typical unit costs for water utility ASR systems now in operation tend to range from \$200,000 to \$600,000 per MGD of recovery capacity” (CH2M Hill, 1993). At the same annual recovery rate used above (100 days at the daily recovery capacity), the costs per thousand gallons recovered would be \$.30 to \$.70 per thousand gallons. These systems have well capacities from 0.3 to 3 MGD and store treated water. Savings in treatment system costs are likely to be substantial when the ASR system offsets the need for capacity to meet peaks in demands.

Table 26. Aquifer Storage and Recovery System Costs.

System	Well Drilling Cost	Equipment Cost	Engineering Cost*	O&M Cost (per 1000 gal)	Energy Cost (per 1000 gal)
Treated Water at System Pressure	\$200,000	\$30,000	\$360,000	\$.004	\$.06
Treated Water Requiring Pumping	\$200,000	\$100,000	\$400,000	\$.006	\$.06

*Engineering costs include the permitting process, hydrogeologic investigation, monitoring during well construction, and design.

Source: PBS&J, 1991, Water Supply Cost Estimates.

Existing ASR Facilities

ASR facilities are already in operation in New Jersey, Nevada, California, and Florida. Five operational facilities are in Florida: Manatee County (1983), Peace River (1984), Cocoa (1987), Port Malabar (1989), and Boynton Beach (1993). These facilities

all use treated water and are further discussed in Appendix I. There are ASR development studies currently underway in Washington, Utah, Arizona, Georgia, South Carolina, Texas, and Virginia.

FLORIDAN AQUIFER SYSTEM (FAS)

In the UEC Planning Area, the primary use of the FAS is for supplemental water for agriculture. The FAS yields nonpotable water throughout most of the planning area. The quality of water in the FAS deteriorates, increasing in hardness and salinity from north to south. Salinity also increases with depth, making the deeper producing zones less suitable for development than those near the top of the system. The system is areally persistent and displays hydrogeologic characteristics favorable to ASR development.

Developments in desalination technology have made treatment of water from the upper portion of the FAS feasible in the planning area where chloride concentrations are not prohibitively high. The cost of tapping the FAS in a given location would depend on a number of variables, including well construction, operation and maintenance, and water treatment. Cost estimates for drilling wells in the major aquifer systems of the planning area are discussed in the Wellfield Expansion section. Treatment costs of desalination technologies (e.g., reverse osmosis and electrodialysis reversal) are discussed in the Water Treatment Technologies section.

Water quality varies throughout the upper portion of the FAS. Generally speaking, the two parameters of greatest concern for use by reverse osmosis and other water treatment technologies are total dissolved solids (TDS) and chloride. Common values for TDS in the upper portion of the FAS are 1,900 mg/L to 8,500 mg/L, chloride range from 1,000 mg/L to 2,000 mg/L. These values vary with depth and production zone.

One of the major constraints on future development of the upper portion of the FAS is degradation of water quality rather than limited quantity. Upconing of saline water is an important consideration in planning additional development in the upper portion of the FAS.

OCEAN WATER

Ocean water averages about 3.5 percent dissolved salts, most of which is sodium chloride, with lesser amounts of magnesium and calcium. Ocean water treatment systems are used successfully worldwide in areas with very limited freshwater supplies. In these areas, reverse osmosis and distillation are two treatment methods which have been used for conversion of ocean water to fresh water. While ocean water

is plentiful and obtainable along the Atlantic Ocean, costs associated with the construction and operation of ocean water reverse osmosis and distillation systems are very high. The cost of ocean water desalination is estimated to be four to eight times the cost of reverse osmosis of the Floridan aquifer. As with all surface waters, the ocean is also vulnerable to discharges or spills of pollutants which could impact a water treatment system.

